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Dairy Marketing Branch
CA Dept. of Food & Ag.

MILK PRICING IN CALIFORNIA

California minimum prices paid for milk to producers are determined through a complex system of reference prices and formulas. The intricacies of the system are often not fully understood which leads to confusion even among those whose livelihood relies on this system. The complexities of the pricing system stem from processors paying different prices for milk according to how the milk is used and payments to producers according to a schedule of quota, base and overbase prices. This paper explains how the various class prices are determined and how they are converted to the pool prices from which producer payments are made.

CLASS PRICES

To promote stability in the dairy industry, California's milk marketing program establishes minimum prices that processors must pay for fluid grade or Grade A milk received from dairy farmers based on end product use. These prices are established within defined marketing areas where milk production and marketing practices are similar. Currently, California operates its milk pricing plan with two marketing areas: Northern California and Southern California. Each marketing area has a separate but essentially identical Stabilization and Marketing Plan. Each plan provides formulas for pricing the five classes of milk. In general, the classes and the products they contain are:

Class 1: Milk used in fluid products.
Class 2: Milk used in heavy cream, cottage cheese, yogurt and sterilized products.
Class 3: Milk used in ice cream and other frozen products.
Class 4a: Milk used in butter and dry milk products, such as nonfat dry milk.
Class 4b: Milk used in cheese, other than cottage cheese.

Milk consists of three basic components: butterfat (fat), solids–not–fat (SNF) and fluid carrier. Prices are assigned to all three components in the determination of the Class 1 milk price. Only the fat and SNF components are used to set the Class 2, 3, 4a and 4b milk prices. Class 2 and 3 prices are adjusted bimonthly according to their pricing formulas, and Class 1, 4a and 4b prices are adjusted monthly according to their formulas.

Pricing Procedures for Classes 4a and 4b

The California Class 4a and 4b pricing formulas rely on commercial market prices for butter, nonfat dry milk (NFDM) and Cheddar cheese. The commodity market prices are adjusted by manufacturing cost allowances and yields specific to California to determine fat and SNF component prices. In general terms, the pricing formula is:

price = (commodity market price – manufacturing cost allowance) * product yield

Class 4a:

The Class 4a price is updated monthly to reflect the most current dairy commodity prices used to establish the 4a fat and 4a SNF component prices. The fat portion of this class of manufacturing milk is primarily used to make butter, and therefore, 4a fat prices are derived from and reflect changes in market prices for butter. Likewise, the SNF portion of this class of manufacturing milk is primarily used to make NFDM, and therefore, 4a SNF prices are derived from and reflect changes in NFDM commodity prices. The specific formulas for the 4a component prices are:

Class 4a fat = ((butter price – $0.0332) – butter manufacturing cost allowance) ∗ butter yield factor

where:

butter price	= higher of the bulk butter price at the Chicago Mercantile Exchange or the federal support purchase price.
butter manufacturing cost allowance	= $0.132 per pound of butter
butter yield factor	= 1.2 pounds of butter per pound of fat

Class 4a SNF = (NFDM price – NFDM manufacturing cost allowance) ∗ NFDM yield factor

where:

NFDM price	= higher of the California weighed average price for nonfat dry milk or the federal support purchase price.
NFDM manufacturing cost allowance	= $0.15 per pound of NFDM
NFDM yield factor	= 1.0 pounds of NFDM per pound of SNF

The Chicago Mercantile Exchange (CME) butter price, butter manufacturing cost allowance, NFDM price, and NFDM manufacturing cost allowance are on a per pound basis. The yield factors reflect the relationship between the component (fat or SNF) and the product (butter or NFDM). For example, one pound of milk fat can be converted to

approximately 1.2 pounds of butter. Similarly, one pound of SNF can be converted to 0.99 pounds of NFDM.

The Department uses the higher of the Grade AA butter price established at the CME or the federal support purchase price for butter ($1.05 per pound as of April 2003) as a base price. The butter price is adjusted by a factor of $0.0332, which represents the difference in the CME price and the price actually received by California butter processors. The CME monthly estimate of market butter price relies on the price data released between the twenty–sixth day of the previous month through the twenty–fifth day of the current month.

The Department uses the higher of California NFDM price or the federal support purchase price for NFDM ($0.80 per pound as of April 2003) as a base price. The California NFDM price is a weighted average price for Extra Grade and Grade A NFDM sales f.o.b. California manufacturing plants. The figure used in the Class 4a pricing formula is estimated each month using data from sales occurring between the twenty–sixth day of the previous month through the twenty–fifth day of the current month.

California has established 3.5% fat and 8.7% SNF as the component standards for whole milk. To get the standard hundredweight (cwt.) price for Classes 4a and 4b multiply the fat component price by 3.5 and the SNF component price by 8.7 and add the two resulting numbers. For example:

$$\text{Class 4a price per cwt.} = (3.5 * \text{4a fat price}) + (8.7 * \text{4a SNF price})$$

Class 4b:

Following the accepted standard of the dairy industry, the Department uses commodity market Cheddar cheese prices to establish the 4b component prices. The 4b formula is updated monthly to reflect the most current Cheddar cheese prices.

The average fat and SNF contents and product yields are the principal factors that determine the price level in the 4b formula. When the 4b formula was revised in 2003, it was determined that many cheese plants in California were fortifying their milk to increase the total solids content in the cheese vat. To reflect the higher solids content, an average test of 3.72% fat and 8.80% SNF, abbreviated as "3.72/8.80 milk" was established. One hundred pounds of milk yields 10.2 pounds of Cheddar cheese. Whey, an often–overlooked byproduct of cheese production, can be used to produce whey butter and dry skim whey. The whey from a 100 pounds of 3.65/8.78 milk yields an average of 0.27 pounds of whey butter and 5.8 pounds of dry skim whey. The value of whey butter is roughly equal to the value of CME Grade AA butter less $0.10 per pound while dry skim whey carries its own price series as reported by USDA in *"Dairy Market News"*. The potential revenue from whey sales is included in the 4b price formula.

The Department uses the higher of the average CME price for 40 pound blocks of Cheddar cheese or the federal support purchase price to set a base price. The base price is adjusted by subtracting $0.0321 per pound from the CME price. This adjustment factor reflects the difference in the CME price and the price actually received by California Cheddar cheese processors. The commodity prices applicable to the Class 4b formula occur between the twenty–sixth day of the previous month through the twenty–fifth day of the current month.

The 4b price calculation consists of four steps. The first step determines the cheese price per cwt. The second and third steps identify the 4b fat price and the 4b SNF price. The final step calculates the per cwt. price of Class 4b 3.5/8.7 milk.

Step 1:

Cheese price per cwt. =

((Cheddar cheese price – $0.0321) – cheese manufacturing cost allowance) ∗ (Cheddar cheese yield) + (CME AA butter – $0.10 – butter manufacturing cost allowance) ∗ whey butter yield + (Dry skim whey price – dry skim whey manufacturing cost) * dry whey yield.

where:

Cheddar cheese price	=	higher of the 40 pound block Cheddar price at the Chicago Mercantile Exchange or the federal support purchase price.
cheese manufacturing cost allowance	=	$0.175 per pound of product
cheese yield factor	=	10.2 lbs. of cheese per cwt. of milk
whey butter manuf. cost allowance	=	$0.132 per pound of product
whey butter yield factor	=	0.27 lbs. of butter per cwt. of milk
dry skim whey price	=	average of the dry whey (Western Mostly) price
dry skim whey manufacturing cost	=	$0.17 per pound of dry skim whey
whey butter yield factor	=	5.8 lbs. of whey per cwt. of milk

Step 2:

Fat in Class 4b milk must be assigned a value. The current formula requires that 4b fat be valued at the same level as the 4a fat, i.e.,

Class 4b fat price = Class 4a fat price

Step 3:

SNF in Class 4b milk also must be assigned a value which is accomplished by subtracting the value of fat from the cheese price calculated in Step 1, i.e.,

$$\text{Class 4b SNF} = \frac{\text{Cheese price per cwt.} - (3.72 * \text{Class 4b fat})}{8.80}$$

Step 4:

Convert component prices to standardized milk (3.5/8.7) milk price per cwt.

$$\text{Class 4b milk per cwt.} = (3.5 * \text{Class 4b fat}) + (8.7 * \text{Class 4b SNF})$$

Pricing Procedures for Classes 2 and 3

The Class 2 and Class 3 prices are determined by simply adding a set differential to the Class 4a component prices. The differentials are intended to impart credit to the producer for a value–added product and are established at levels that do not provide any economic incentive for manufacturers outside the state to ship identical products into California or for manufacturers within California to reconstitute products from intermediate dairy products, such as butter and NFDM.

Class 2 and Class 3 prices are established on a bi–monthly basis prior to the beginning of each even month. For example, the February–March period pricing period for Class 2 and Class 3 milk uses the average Class 4a component prices for December and January. The general formulas for each component within class are:

$$\text{Class 3 fat} = \text{Average Class 4a fat} + \begin{pmatrix} \$0.0370 \text{ in Northern California} \\ \text{OR} \\ \$0.0393 \text{ in Southern California} \end{pmatrix}$$

$$\text{Class 3 SNF} = \text{Average Class 4a SNF} + (\$0.0586 \text{ throughout California})$$

$$\text{Class 2 fat} = \text{Average Class 4a fat} + \begin{pmatrix} \$0.0370 \text{ in Northern California} \\ \text{OR} \\ \$0.0393 \text{ in Southern California} \end{pmatrix}$$

$$\text{Class 2 SNF} = \text{Average Class 4a SNF} + \begin{pmatrix} \$0.0643 \text{ in Northern California} \\ \text{OR} \\ \$0.0901 \text{ in Southern California} \end{pmatrix}$$

Pricing Procedures for Class 1

Determining the price for fluid milk products involves several steps. The Class 1 fat price for fluid milk pricing formula is set directly and uses the Chicago Mercantile Exchange (CME) butter price with an adjustment . The SNF and carrier prices are calculated as residuals. They rely on a basic price mover called the commodity reference price (CRP) which is based off the higher of the CME price for Cheddar cheese or the CME Grade AA butter and California weighted average price for nonfat dry milk. The Class 1 fat price is subtracted from the CRP and the remaining residual value is allocated to SNF and carrier. Once the component prices have been assigned to fat, SNF, and fluid carrier portions of milk, the implied value of raw milk can be calculated.

Step 1:

Price of Class 1 fat = (CME butter – $0.10) x 1.2

Step 2:

Commodity Reference Price is the **higher of**:

(CME Cheddar) x 9.8 + (CME AA butter – $0.10) x 0.27

OR

(CME butter x 1.2) x 3.5 + (CA NFDM x 0.99) x 8.7

Step 3:

Price of Class 1 SNF = (((CRP + $0.464) – (Class 1 fat price x 3.5)) x 0.76)/8.7

Step 4:

Price of Class 1 carrier = (((CRP + $0.464) – (Class 1 fat price x 3.5)) x 0.24)/87.8

For Northern California, subtract an additional $0.0031 from the per pound price of fluid carrier.

Step 5:

Class 1 price per 100 pounds of milk (@3.5% fat and 8.7% SNF)

= (3.5 x Class 1 fat) + (8.7 x Class 1 SNF) + (87.8 x Class 1 carrier)

POOL PRICES

Payments to California milk producers are determined through a system of quota and non–quota pool prices. The Milk Pooling Branch at the Department is responsible for converting the five separate class prices to the pool prices. Pool prices for fat and SNF are calculated separately. The following hypothetical examples illustrate the procedure used.

FAT POOL PRICES

The Milk Pooling Branch receives production reports from all processing plants in the state, which detail how much milk each plant received and how it was used it. For example, say that these reports show 1,000,000 pounds of fat were produced in

January. The report also indicates that 300,000 pounds were used in Class 1 products; 50,000 pounds were used in Class 2 products; 50,000 pounds were used in Class 3 products; 300,000 pounds were used in Class 4a products; and 300,000 pounds were used in Class 4b products. Each class of fat has its own price as described earlier. Assume for this exercise that the fat prices are $0.99 for Class 1; $0.79 for Class 2; $0.78 for Class 3; $0.72 for Class 4a; and $0.72 for Class 4b.

Multiplying the fat prices in each class by the individual class uses provides an indication of the revenue generated per class. The class revenues are summed to give the revenue attributable to uses of fat. Dividing the total fat revenue by the total fat production gives an average fat price weighted by the different class uses. To summarize,

$$= \frac{[(300{,}000 * \$0.99) + (50{,}000 * \$0.79) + (50{,}000 * \$0.78) + (300{,}000 * \$0.72) + (300{,}000 * \$0.72)]}{1{,}000{,}000}$$

$$= \frac{[\$297{,}000 + \$39{,}500 + \$39{,}000 + \$216{,}000 + \$216{,}000]}{1{,}000{,}000}$$

$$= \frac{\$807{,}500}{1{,}000{,}000} = \$0.8075 \text{ per pound of fat}$$

SNF POOL PRICES

The process to determine the pool prices for SNF is slightly more involved than that described for fat pool prices. This is the result of two complicating factors:

1. Currently there is a $1.70 spread between quota and non–quota milk at 3.5% and 8.7% test. The spread is maintained by setting quota and non–quota SNF prices equal initially and then the price of quota SNF is increased to $0.195 per pound greater than non–quota SNF ($1.70 divided by 8.7 equals $0.195).

2. In the Class 1 formula fluid carrier must be assigned a value but a pool price for the fluid carrier does not exist. Consequently, the revenue generated by the fluid carrier is transferred to the SNF pool.

As with the fat pool pricing procedure, the Milk Pooling Branch receives reports from manufacturing plants detailing milk receipts and usage. For example, say that these reports show 1,000,000 pounds of SNF and 9,000,000 pounds of fluid products were produced in January. The report also indicates that 350,000 pounds were used in Class 1 products; 50,000 pounds were used in Class 2 products; 30,000 pounds were used in Class 3 products; 260,000 pounds were used in Class 4a products; and 310,000 pounds were used in Class 4b products. Each class of SNF has its own price, and for this

exercise the prices are \$0.90 for Class 1; \$0.96 for Class 2; \$0.93 for Class 3; \$0.90 for Class 4a; and \$0.95 for Class 4b. Class 1 fluid carrier price is set at \$0.02 per pound.

Multiplying the SNF prices in each class by the individual class uses provides an indication of the revenue generated. The class revenues are summed to give the revenue attributable to uses of SNF. Dividing the total SNF revenue by the total SNF production gives an average SNF price weighted by the different class uses. To summarize,

$$= \frac{\left[\begin{array}{l}(350{,}000 * \$0.90) + (50{,}000 * \$0.96) + (30{,}000 * \$0.93) + (260{,}000 * \$0.90) \\ + (310{,}000 * \$0.95) + (9{,}000{,}000 * \$0.02)\end{array}\right]}{1{,}000{,}000}$$

$$= \frac{[\$315{,}000 + \$48{,}000 + \$27{,}900 + \$234{,}000 + \$294{,}500 + \$180{,}000]}{1{,}000{,}000}$$

$$= \frac{\$1{,}099{,}400}{1{,}000{,}000} = \$1.0994 \text{ per pound of SNF}$$

After the price per pound of SNF has been determined, the \$1.70 spread between the quota and non–quota price can be instituted. This is accomplished by removing \$0.195 for each pound of SNF quota from the SNF revenue pool which requires that the Milk Pooling Branch be knowledgeable of the number of pounds of SNF quota held by dairyman in the state. Assume that of the 1,000,000 pounds of SNF produced 400,000 pounds were covered by quota.

The 400,000 pounds is multiplied by \$0.195 and the resulting figure is subtracted from the total SNF revenue pool. The remaining pool revenue is divided by the total pounds of SNF produced for the month to get the non–quota SNF price per pound:

$$= \frac{(\$1{,}099{,}400 - [400{,}000 * \$0.195])}{1{,}000{,}000}$$

$$= \frac{(\$1{,}099{,}400 - \$78{,}000)}{1{,}000{,}000}$$

$$= \frac{\$1{,}021{,}000}{1{,}000{,}000} = \$1.0214 \text{ per pound of non - quota SNF}$$

For this exercise, the quota SNF price would be $1.0214 + $0.195 = $1.2164 per pound.

To convert per pound prices to prices per cwt., multiply the fat price by 3.5 and the SNF price by 8.7 and sum the revenues. In this example the quota and non–quota prices are:

$$\begin{aligned}\text{Quota price} &= \left[(3.5 * \$0.8075) + (8.7 * \$1.2164)\right] \\ &= \left[\$2.8263 + \$10.5827\right] \\ &= \$13.4090\end{aligned}$$

$$\begin{aligned}\text{Non} - \text{quota price} &= \left[(3.5 * \$0.8075) + (8.7 * \$1.0214)\right] \\ &= \left[\$2.8263 + \$8.8862\right] \\ &= \$11.7125\end{aligned}$$

The actual computations of the pool prices may be modified further by regional quota adjusters (RQAs), plant to plant transportation credits, ranch to plant transportation allowances, and other adjustments that, for the purposes of brevity, are not addressed here.

The topics covered in this briefing paper should help to understand the calculations of and the differences between class prices and pool prices for milk in California.